



NASHUA COMMUNITY COLLEGE

COURSE OUTLINE FORM

Course Title: ADVANCED AUTOMOTIVE ELECTRICITY AND ELECTRONICS			
Course Prefix & No.: AUTO205N	Lecture Hours: 2	Lab Hours: 4	Credit Hours: 4
Department: Transportation Technology			
Program: Automotive Technology			
Revision Date: 12/2021			

Prerequisites/ Co-requisites:

AUTO113N, AUTO121N

Required Accuplacer Score:

Entrance Skills:

- A minimum of one year of high school Algebra I is recommended.
- Basic skills in written English are required.
- Basic reading skills are required.
- Basic computer skills are required.
- Students are expected to possess a good work ethic and a strong desire to learn.
- A valid motor vehicle driver's license is required.

Catalog Description:

The course includes operating principles and troubleshooting of various systems, body computers, multiplexing, keyless entry, etc. Testing of sensors and circuits and On-board diagnostics related to these systems will be covered.

Course Competencies:

Competency (Knowledge and Skills)	Critical Thinking Level	Linked to Program Outcome(s) #
Students will be able to:		
1. To develop safe working habits and respect for equipment and shop management.	Recognize and apply	
2. Understand the operation of components found in solid state circuitry, such as capacitors, transistors, diodes and resistors.	Identify and apply	
3. Proper knowledge and interpretation of wiring diagrams of computer-controlled systems.	Recognize and apply	
4. Diagnose systems with the use of diagnostic test equipment.	Analyze	
5. Understand the basics of multiplex systems.	Recognize	
6. To become proficient at reading wiring diagrams and service manuals.	Recognize, apply and analyze	
7. To build experience and competence in the troubleshooting of electrical problems on vehicles.	Recognize, apply and analyze	

Course Outline:

Content Topic	Subtopics (a., b., etc.)
Introduction and Shop Safety	<ul style="list-style-type: none"> a. Battery safety b. Electrical safety c. Hybrid safety

Computer Fundamentals	<ul style="list-style-type: none"> a. Computer design and operation b. Input and output testing and operation c. Diagnostic procedures
Test Equipment	<ul style="list-style-type: none"> a. Oscilloscopes b. Graphing Multi-meters
Communication Systems	<ul style="list-style-type: none"> a. Design and operation of communication systems b. Diagnostic procedures c. Repair and testing of communication systems
Accessory Circuits	<ul style="list-style-type: none"> a. Comfort systems b. Convenience systems c. Anti-theft systems d. Audio systems e. Driver Information and Navigation Systems

Performance Evaluation:

<p>Formative Assessments</p> <ul style="list-style-type: none"> 1. Lab participation grade 2. Classroom participation 3. Quizzes 4. Midterm exam 5. Homework assignments, reading 	<p>Summative Assessments</p> <ul style="list-style-type: none"> 1. Final exam 2. Lab practical exam
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Method of Instruction:

1. Lecture and discussion
2. Required reading
3. Demonstration
4. Laboratory work

Instructional Facilities:

For this course a traditional classroom with working audio/visual equipment is required as well as working lab space in the automotive lab. Access to both a lab classroom with benches and main shop space with lifts is required for this class.

Revision History:

February, 2008 Brian Creegan
April, 2013 Brian Creegan
January, 2017 Dan Jones
December 2021 Jason Felton

Will this course be taught online? Yes___No X__

If yes, please complete the Online Course Outline Form.



NASHUA COMMUNITY COLLEGE
COURSE OUTLINE FORM

Course Title: AUTOMOTIVE ENGINE PERFORMANCE II			
Course Prefix & No.: AUTO215N	Lecture Hours: 2	Lab Hours: 4	Credit Hours: 4
Department: Transportation Technology			
Program: Automotive Technology			
Revision Fate: 12/2018			

Prerequisites/ Co-requisites:

AUTO185N,AUTO205N

Required Accuplacer Score:

Entrance Skills:

- Basic skills in written English are required.
- Basic reading skills are required.
- Basic computer skills are required.
- Basic understanding of automotive electricity is required.
- Basic understanding of tools and procedures used to perform automotive repair is required.
- Basic understanding of physics principles is required.
- Students are expected to possess a good work ethic and a strong desire to learn.
- A valid motor vehicle driver's license is required

Catalog Description:

A continuation of Engine Performance I with a focus on advanced diagnostics of engine control systems using, OBD-II interface and lab scopes. The function and operation of the supporting emission systems to include exhaust Catalyst, EVAP and EGR systems will be covered.

Course Competencies:

Competency (Knowledge and Skills)	Critical Thinking Level	Linked to Program Outcome(s) #
Students will be able to:		
1. A working knowledge of basic fuel and electronic fuel injection systems including related computer control systems.	Recognize	
2. The ability to troubleshoot and repair engine performance concerns.	Apply and analyze	
3. A working knowledge of automotive emission control systems.	Recognize, apply and analyze	
4. The ability to troubleshoot and repair automotive emission control systems.	Recognize and analyze	
5. The ability to determine the relationship between ignition system failures and fuel system failures and how exhaust emissions levels are influenced by each.	Identify and analyze	
6. The ability to use the appropriate electronic test equipment.	Recognized and apply	
7. Safe working habits and respect for the equipment, and shop management personnel.	Recognize and apply	

Course Outline:

Content Topic	Subtopics
INTRODUCTION AND SHOP SAFETY	a. Working around moving parts and flammable liquids

Vehicle Emission Standards and On Board Diagnostics	<ul style="list-style-type: none"> a. Theory of operation b. Use of scan tools to diagnosis and repair trouble codes c. Monitor and readiness status
Catalytic Convertors, Oxygen sensors and Lambda sensor	<ul style="list-style-type: none"> a. Theory of operation b. Use of Fuel Trims c. Catalyst testing d. Use of Oscilloscope
Scan Tools and Engine Performance Diagnosis	<ul style="list-style-type: none"> a. Snap shots b. Freeze Frame Data c. Bi-Directional controls
Evaporative Emission Control Systems	<ul style="list-style-type: none"> a. Theory of operation b. Use of Bi-Directional control c. Vacuum testing of vent solenoids d. Use of “smoke machine”
Exhaust Gas Recirculation Systems	<ul style="list-style-type: none"> a. EGR System operation, inspection and testing
Positive Crank Case Ventilation	<ul style="list-style-type: none"> a. PCV operation and inspection
Secondary Air Injection Systems	<ul style="list-style-type: none"> a. Operation and inspection
Variable Cam timing	<ul style="list-style-type: none"> a. Operation and inspection

Performance Evaluation:

Formative Assessments	Summative Assessments
1. Lab participation grade 2. Classroom participation 3. Quizzes 4. Midterm exam 5. Homework assignments, reading	1. Final exam 2. Lab practical exam

Method of Instruction:

1. Lecture and discussion
2. Required reading
3. Demonstration
4. Laboratory work

Instructional Facilities:

Instructional facilities required for this course include:

1. A traditional classroom with working audio/visual equipment.
2. Lab space including tools and equipment commonly found in an automotive facility.

Revision History

October, 2007 Brian Creegan
October, 2012 Brian Creegan
April, 2013 Brian Creegan
January, 2017 Tim Hogan
December 2018 increase lab hours & credits to 4
December 2021 Jason Felton

Will this course be taught online? Yes ___ No ___

If yes, please complete the Online Course Outline Form.



NASHUA COMMUNITY COLLEGE
COURSE OUTLINE FORM

Course Title: Automotive Heating And Air Conditioning			
Course Prefix & No.: AUTO221N	Lecture Hours: 2	Lab Hours: 3	Credit Hours: 3
Department: Transportation Technology			
Program: Automotive Technology			
Revision Date: 12/2021			

Prerequisites/ Co-requisites:

AUTO121N, AUTO113N. Co-requisite: PHYS101

Required Accuplacer Score:

Entrance Skills:

- Basic skills in written English are required.
- Basic reading skills are required.
- Basic computer skills are required.
- Basic understanding of automotive electricity is required.
- Basic understanding of tools and procedures used to perform automotive repair is required.
- Basic understanding of physics principles is required.
- Students are expected to possess a good work ethic and a strong desire to learn
- A valid motor vehicle driver's license is required

Catalog Description:

The theory and operation of automotive heating, ventilation and air conditioning systems will be covered including safety, maintenance, adjustment, diagnosis and repair. Major areas of study will include automotive ventilation systems, heating and air conditioning theory, manual and automatic climate control systems, air conditioning component repair and replacement procedures, refrigerant safety, recovery, recycling and recharge

Prerequisites: AUTO121N, AUTO113N; Corequisite: PHYS101N

Course Competencies:

Competency (Knowledge and Skills)	Critical Thinking Level	Linked to Program Outcome(s) #
Students will be able to:		
1. The student will learn to perform the tasks of a service technician in a safe, clean, neat and ethical manner.	Recognize and apply	
2. The student will learn the theory of operation of automotive heating, ventilation and air conditioning systems including environmental concerns.	Recognize and apply	
3. The student will learn proper diagnosis and repair procedures for automotive heating and ventilation systems.	Apply and analyze	
4. The student will learn the proper diagnosis and repair procedures for automotive air conditioning systems.	Recognize and analyze	
5. The student will learn to properly diagnose and repair manual heating, ventilation and air conditioning controls.	Recognize and analyze	
6. The student will learn to properly diagnose and repair automatic climate control system controls.	Recognize and analyze	
7. The student will learn the proper procedures for the safe handling of refrigerants used in automotive air conditioning systems.	Recognize and apply	

8. The student will learn the proper use of refrigerant recovery/recycling/charging equipment.	Apply	
9. The student will learn proper refrigerant leak detection.	Apply	
10 The student will learn the proper procedures for servicing automotive air conditioner compressors.	Apply and analyze	
11. The student will learn to properly perform retrofit procedures	Recognize and apply	
12. The student will learn the proper procedures for heater core removal and installation.	Recognize and apply	

Course Outline:

Content Topic	Subtopics (a., b., etc.)
Introduction	
Heating and ventilation	<ul style="list-style-type: none"> a. Types of systems b. Operation c. Service d. Cases and ducts
Heating systems	<ul style="list-style-type: none"> a. Theory of operation b. Heater components c. Heater diagnosis, service and repair d. Heater controls

Refrigerants	<ul style="list-style-type: none"> a. Refrigerant safety b. Types of refrigerants c. Refrigerants and the environment d. Legislation e. Refrigerant recovery and recycling
Heat movement theory	<ul style="list-style-type: none"> a. Heat movement b. States of matter c. Latent and sensible heat d. Boiling points e. Saturated vapors and pressure temperature relationship f. Pressure, gauge and absolute
Air conditioning systems	<ul style="list-style-type: none"> a. Types of systems b. Types of components c. Lines and hoses d. Low side operation e. High side operation
Air conditioning controls	<ul style="list-style-type: none"> a. Electrical switches and evaporator temperature controls b. Control head c. Automatic climate control d. Control diagnosis, service and repair
Air conditioning system inspection and diagnosis	<ul style="list-style-type: none"> a. System inspection b. Problem diagnosis c. Air conditioning pressure checks d. Air conditioning system refrigerant leak tests e. Preventive maintenance operations
Air conditioning system repair	<ul style="list-style-type: none"> a. Compressor repair b. Hose and fitting repair c. Air conditioning component replacement d. Air conditioner evacuation and recharge procedures
Retrofit	<ul style="list-style-type: none"> a. Retrofit reasons b. Types of retrofit available c. Retrofit procedures

Performance Evaluation:

Formative Assessments	Summative Assessments
<ol style="list-style-type: none">1. Lab participation grade2. Classroom participation3. Quizzes4. Midterm exam5. Homework assignments, reading	<ol style="list-style-type: none">1. Final exam2. Lab practical exam

Method of Instruction:

1. Lecture and discussion
2. Required reading
3. Demonstration
4. Laboratory work

Instructional Facilities:

Instructional facilities required for this course include:

1. A traditional classroom with working audio/visual equipment.
2. Lab space including tools and equipment commonly found in an automotive facility involved with automotive heating and air conditioning repairs.

Revision History:

Outline developed, December, 1998 Roland Gies
December, 2006 Roland Gies
October, 2008 Roland Gies
December, 2009 Roland Gies
April, 2013 Roland Gies
January, 2017 Tim Hogan
December 2018 increase lab & credits to 4
December 2021 Jason Felton

Will this course be taught online? Yes ___ No X ___ If yes, please complete the Online Course Outline Form.



NASHUA COMMUNITY COLLEGE

COURSE OUTLINE FORM

Course Title: Automotive Power Trains			
Course Prefix & No.: AUTO226N	Lecture Hours: 2	Lab Hours: 4	Credit Hours: 4
Department: Transportation			
Program: Automotive Technology			
Revision Date: 12/2021			

Prerequisites/ Co-requisites:

AUTO121N

Required Accuplacer Score: N/A

Entrance Skills:

- Reading, writing, computational skills as well as computer skills
- Proper lifting techniques, proper tool identification and usage, proper measuring tool usage
- Ability to follow repair instructions both written and verbal
- Ability to use supplied resources for gathering information
- Proper methods for disposal of automotive fluids and components
- A valid motor vehicle driver's license is required

Catalog Description:

This course is designed to introduce students to the basic principles employed in the construction, operation and diagnosis of the various components and systems involved in the manual drive train of current automotive vehicles. Topics for this course include cover clutches, manual transmissions/transaxles, both front and rear wheel drive train components including drive shafts, axles and differentials. Four-wheel drive and all-wheel drive systems are discussed as well. This course is designed to meet the requirements of ASE Education Foundation certification in the topic of manual drive train and axles.

Course Competencies:

Competency (Knowledge and Skills)	Critical Thinking Skills	Linked to Program Outcome(s) #
Students will be able to:		
1. Understand Basic clutch operation and components	Recognize, identify	
2. Understand basic manual transmission operation and components	Identify and analyze	
3. Understand drive line operation and components	Identify	
4. Understand differential operation and components	Identify	
5. Understand four wheel and AWD operation and components	Identify and analyze	

Course Outline:

Content Topic	Subtopics (a., b., etc.)
Drive train theory	a) torque multiplication b) gear ratios c) drive train basic component identification
Clutch theory and operation	a) basic clutch design and construction b) basic clutch operation c) clutch diagnosis d) clutch repair procedures
Manual transmission theory and operation	a) basic transmission design and construction b) basic transmission operation and power flow c) Transmission diagnosis d) transmission disassembly, repair and reassembly

Constant velocity joints and front axles	<ul style="list-style-type: none"> a) cv joint design and construction b) cv joint diagnosis and repair c) front axle design and repair
Drive shafts and universal joints	<ul style="list-style-type: none"> a) drive shaft design and construction b) vibration and noise diagnosis and repair c) u-joint construction and repair
Rear differentials	<ul style="list-style-type: none"> a) basic differential theory and designs b) differential component identification c) differential diagnosis and repair
Four wheel drive systems	<ul style="list-style-type: none"> a) FWD and AWD theory and operation b) basic component identification c) system diagnosis and repair

Performance Evaluation:

<p>Formative Assessments</p> <ul style="list-style-type: none"> a) lab participation grade b) classroom participation c) quizzes d) midterm exam e) homework assignments 	<p>Summative Assessments</p> <ul style="list-style-type: none"> a) final exam b) lab practical exam
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Method of Instruction:

The methods of instruction that will be used in this course include but are not limited to:

- a) lecture
- b) required reading
- c) lab instruction
- d) written assignments
- e) watching assigned and in class videos
- f) Canvas usage

Instructional Facilities:

For this course a traditional classroom with working audio/visual equipment is required as well as working lab space in the automotive lab. Access to both a lab classroom with benches and main shop space with 4 lifts is required for this class.

Revision History:

9/10/2007 Al DeRosa
2/14/21013 Al DeRosa
1/5/2017 Tim Hogan
December 2021 Jason Felton

Will this course be taught online? Yes ___ No X

If yes, please complete the Online Course Outline Form.



NASHUA COMMUNITY COLLEGE

COURSE OUTLINE FORM

Course Title: Automatic Transmissions			
Course Prefix & No.: AUTO227N	Lecture Hours: 2	Lab Hours: 4	Credit Hours: 4
Department: Transportation			
Program: Automotive Technology			
Revision Date: 12/2021			

Prerequisites/ Co-requisites: AUTO113N, AUTO121N
Required Accuplacer Score: N/A

Entrance Skills: <ul style="list-style-type: none">• Reading, writing and computational skills as well as computer skills• Proper lifting techniques• Proper tool identification and usage, proper measuring tool usage• Ability to follow repair instructions both written and verbal• Ability to use supplied resources for gathering information• Proper methods for disposal of automotive fluids and components• A valid motor vehicle driver's license is required

Catalog Description: <p>This course covers the theory of operation and overhaul of automatic transmissions. The lecture focuses on the operation of automatics and uses case studies to show common failures and diagnostic steps. The lab focuses on hands on diagnosis and repair, R&R of complete units, transmission overhauls and the installation of Shift kits.</p> <p>Prerequisites: AUTO113N, AUTO121N</p>
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Course Competencies:

Competency (Knowledge and Skills) Students will be able to:	Critical Thinking Level	Linked to Program Outcome(s) #
1. Road test a vehicle and determine if the transmission has a problem	Recognize and apply	
2. To acquire an understanding of basic power transmission principles	Recognize	
3. To acquire an understanding of fluid coupling principles	Comprehension	
4. To develop skill in diagnose if a failure is internal or external and appropriate repair procedure	Analyze and apply	
5. To develop skill in removing and disassembling an automatic transmission	Apply	
6. To develop skill in the inspection of internal components	Analyze	
7. To develop skill in the overhaul of automatic transmissions	Apply and identify	
8. To develop skill in making internal and external adjustments of the transmission and control systems	Recognize apply and analyze	
9. To develop skill in using special tools and test equipment	Identify and apply	

Course Outline:

1. Transmission and transaxle fundamentals	<ul style="list-style-type: none">a. Intro to automatic transmissionsb. History and developmentc. Transmission identificationd. Gears and gearsetse. Gear typesf. Gear ratiog. Planetary gearsets
2. Hydraulic fundamentals	<ul style="list-style-type: none">a. Hydraulic principlesb. Simple hydraulic systemsc. Transmission hydraulic systemsd. Pressure development and controle. Transmission shifting and shift pointsf. Transmission hydraulic pressures
3. Fluid coupling	<ul style="list-style-type: none">a. Fluid couplingsb. Torque convertersc. Lock-up torque convertersd. Converter testing and diagnoses
4. Apply devices	<ul style="list-style-type: none">a. Transmission bandsb. Servos and accumulatorsc. Multiple disc clutchesd. One-way clutchese. Clutch timing and controlf. Apply device interaction
5. Transmission fluid system and sealing, supporting, and spacing	<ul style="list-style-type: none">a. Transmission fluid typesb. Transmission filters and coolersc. Transmission serviced. Gaskets and sealse. Bushings and thrust washersf. Snap rings
6. Transmission and transaxle electronics	<ul style="list-style-type: none">a. Basic computer and electronic controlb. Electronic control systemsc. Onboard diagnostics

Performance Evaluation:

Formative Assessments <ul style="list-style-type: none">a. Lab participationb. Classroom participationc. Quizzesd. Midterm exame. Homeworkf. Final exam	Summative Assessments <ul style="list-style-type: none">a. Quality of work done in labsb. Quantity of work done in labsc. Tardiness and absenteeismd. Alternative assignments(essays)
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Method of Instruction:

- a. Lecture/discussion
- b. Required reading/homework
- c. Lab demonstrations/exercises
- d. Live work
- e. Canvas
- f. Power point

Instructional Facilities:

This course requires a traditional classroom with audio/visual equipment as well as a dedicated lab space with multiple work benches, parts washer, press, special shop tools, vise, and testing and flushing equipment. Also needed is space in the main shop with 4 lifts minimum

Revision History:

4/17/2010 Peter Berger
4/8/2013 Peter Berger
1/5/2017 Tim Hogan
December 2021 Jason Felton

Will this course be taught online? Yes___No_X__

If yes, please complete the Online Course Outline Form.



NASHUA COMMUNITY COLLEGE

COURSE OUTLINE FORM

Course Title: Automotive Engine Repair: A Capstone Course			
Course Prefix & No. AUTO228N	Lecture Hours: 2	Lab Hours: 6	Credit Hours: 4
Department: Transportation			
Program: Automotive			
Revision Date: 12/2021			

Prerequisites/ Co-requisites:

AUTO185N, AUTO205N, PHYS 101

Required Accuplacer Score: N/A

Entrance Skills:

- Reading, writing, computational skills as well as computer skills.
- Proper lifting techniques, proper tool identification and usage, proper measuring tool usage
- Ability to follow repair instructions both written and verbal
- Ability to use supplied resources for gathering information and the proper methods for disposal of automotive fluids and components.
- A valid motor vehicle driver's license is required.

Catalog Description:

This course is designed to give students a better understanding of current practices involved in the diagnosis, disassembly, cleaning, repair and reassembly of today's modern engines. Topics for this course will include engine diagnostic procedures, engine removal practices, proper teardown, cleaning and inspection processes, best practices for component repair/replacement, reassembly and engine reinstallation. There will also be discussion about engine design, performance modifications and specifics regarding certain engine features that are manufacturer specific. This course is designed to meet all of the requirements for ASE Education Foundation certification in the Engine Repair section. There is also a Capstone Assignment that is part of this course.

Course Competencies:

Competency (Knowledge and Skills)	Critical Thinking Skills	Linked to Program Outcome(s) #
Students will be able to:		
1. Understand basic engine theory to properly diagnose engine mechanical failures	Apply	
2. Understand proper engine removal procedures	Employ	
3. Understand proper teardown and cleaning procedures	Analyze	
4. Identify cause of failure and appropriate repair procedure	Recognize analyze and apply	
5. Understand proper engine repair processes	Analyze and apply	
6. Understand proper reassembly procedures for engine mechanical parts	Apply	
7. Understand how to safely and efficiently reinstall an engine	Apply	

Course Outline:

Content Topic	Subtopics (a., b., etc.)
Safety and Engine Diagnosis	a) Shop safety b) Engine theory c) Engine diagnostic testing d) Diagnostic evaluation
Engine Disassembly, Cleaning, and Inspection	a) Teardown procedures b) Proper cleaning methods for different parts c) Methods of inspection d) Crack detection
Engine Block	a) Design b) Construction c) Inspection d) Repair processes
Cylinder heads	a) Cylinder head design b) Cylinder head inspection and repair c) Camshaft design and inspection d) Valve train design and inspection
Engine rotating assembly	a) Crankshaft design, inspection and repair b) Piston design, inspection and repair c) Connecting rod design, inspection and repair d) Piston ring design, inspection and repair
Engine reassembly	a) Proper engine assembly procedures b) Proper engine reinstallation procedures c) In car engine service

Performance Evaluation:

Formative Assessments	Summative Assessments
a) lab participation grade b) classroom participation c) quizzes d) midterm exam e) homework assignments	a) final exam b) lab practical exam c) completed Honda modules

Method of Instruction:

The methods of instruction that will be used in this course include but are not limited to:

- a) lecture
- b) required reading
- c) lab instruction
- d) written assignments
- e) watching assigned and in class videos
- f) Canvas usage
- g) Capstone assignment

Instructional Facilities:

For this course a traditional classroom with working audio/visual equipment is required as well as working lab space in the automotive lab. Access to both a lab classroom with benches and main shop space with lifts is required for this class.

Revision History:

5/2012 Al DeRosa
2/25/21013 Al DeRosa
1/5/2017 Tim Hogan
December 2021 Jason Felton

Will this course be taught online? Yes ___ No X

If yes, please complete the Online Course Outline Form.